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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/358,388	07/21/99	UMEZAWA	K 0039-79292-2

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EXAMINER

MAI.A

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 02/23/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No.	Applicant(s)	
	09/358,388	UMEZAWA ET AL.	
	Examiner	Art Unit	
	Anh D. Mai	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

- 1) ☒ Responsive to communication(s) filed on 17 December 1999.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 9-23 is/are pending in the application.
- 4a) Of the above claim(s) 16-23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 9-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☒ All b) ☐ Some * c) ☐ None of the CERTIFIED copies of the priority documents have been:
1. ☐ received.
2. ☒ received in Application No. (Series Code / Serial Number) 08/751,438.
3. ☐ received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

Attachment(s)

- | | |
|---|--|
| 14) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 17) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 15) <input checked="" type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 18) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 16) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>2</u> . | 19) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claim 13 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 13 is similar to claim 12 in scope.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 9-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sun (U.S. Patent No. 5,496,764) in view of Wolf et al. "Silicon Processing".

Sun teaches a method of manufacturing a semiconductor substrate having a shallow trench isolation similar as claimed including:

- (a) a first step of forming a plurality of grooves (31) on part of a surface of the substrate (20);

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(b) a second step of burying oxide film (41) in the grooves by a silicon based material; and

(c) a third step of annealing the oxide films at a substrate temperature.

(See Fig. 4, col. 2, l. 21-col. 3, l. 27).

Sun fails to disclose the material for the silicon based oxide film (41).

However, Wolf, in Silicon Processing, teaches silicon oxide can be deposited by CVD using organic silicon based material (TEOS). (See table 4, page 194).

It would have been obvious to one having ordinary skill in the art at the time of the invention was made to deposit the oxide film (41) of Sun using TEOS by CVD as taught by Wolf because TEOS by CVD results in a conformal film.

Further, the annealing temperature of Sun is overlapped the presently claimed range.

With respect to claim 10, LPCVD is one of the deposition method teaches by Wolf.

With respect to claim 11, the ambient during the anneal of Sun includes inert gases and inert gas such as He, Ne, Ar, Kr, Xe or nitrogen are well known in the art.

With respect to claim 12, the oxide film (41) is deposited thicker than the depth of the grooves and then planarized so that the substrate is exposed. (See Figs. 4 and 5).

With respect to claim 13, the same reasons as rejected claim 12 also apply.

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With respect to claim 14, trench (31) has a depth (d) to width (l) ratio of less than 10.

With respect to claim 15, it appears that the ratio of trench width (l1) over the pitch (l2) of Sun is less than 1.5 along a specified direction. (See Fig. 3).

3. Claims 9-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moon et al. (U.S. Patent No. 5,985,735) in view of Sun '764.

Moon teaches a method of manufacturing a semiconductor substrate having a shallow trench isolation similar as claimed including:

(a) a first step of forming groove (13) on part of a surface of the substrate (10);

(b) a second step of burying oxide film (16) in the grooves by an organic silicon based CVD method; and

(c) a third step of annealing the oxide films at a substrate temperature. (See Fig. 5, col. 6, l. 56-col. 7, l. 41).

Moon fails to anneal the oxide film (16) at a substrate temperature of 1100 to 1350 degree C.

However, Sun, in a method of forming a semiconductor device, teaches annealing the substrate at a temperature of 1000 to 1200 degree C. (See col. 3, ll. 13-27).

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It would have been obvious to one having ordinary skill in the art at the time of the invention was made to anneal the substrate of Moon at a temperature as taught by Sun to completely densify the oxide film.

Further, Moon discloses only one trench isolation (13), it would have been obvious to one having ordinary skill in the art at the time of the invention was made to form a plurality of trench (13) on the surface of a substrate.

With respect to claim 10, the CVD methods are disclosed by Moon.

With respect to claim 11, the ambient during the anneal of Sun includes inert gases such as Ar and nitrogen.

With respect to claim 12, the oxide film (16) is deposited thicker than the depth of the grooves and then planarized so that the substrate is exposed. (See Fig. 5).

With respect to claim 13, the same reason as rejected claim 12 also apply.

With respect to claim 14, trench (13) has a depth (d) to width (l) ratio of less than 10.

With respect to claim 15, in view of Sun, it appears that the ratio of trench width (l1) over the pitch (l2) of Sun is less than 1.5 along a specified direction. (See Fig. 3).

Response to the Traversal.

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Even though the process steps of claim 9 and claim 16 contain some analogous steps however the process of claim 9 and claim 16 are result in completely different devices. (See Figs. 3C and 14C).

The restriction is not about combination/ sub-combination but it is about two independently distinct processes that results in two completely different devices.

The restriction is therefore final.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (703) 305-0575. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

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A.M.
Anh D. Mai
February 14, 2000

W. Chandler